

REMARKS

Claims 9 and 12 have been amended to comply with 35 USC §112, second paragraph, and new method claims 15-21 have been added. No new matter was added. Thus, claims 1, 7 and 9-21 are pending. Arguments for the patentability of the claims over the prior art of record are presented. Accordingly, Applicants respectfully submit that the present application is in condition for allowance.

I. Claim Rejection - 35 USC §112, Second Paragraph

In the non-final Office Action dated November 12, 2008, claims 9 and 12 are rejected under 35 USC §112, second paragraph, as being indefinite.

Claim 9 is directed to high purity copper sulfate, and claim 12 is directed to a method of making high purity copper sulfate. In the Office Action, the Examiner notes that the limitations recited in claims 9 and 12 are directed to “copper sulfate in water” and thus it is not clear how dependent claims 9 and 12 further limit the base independent claims.

Page 5, lines 13-16, of the present application, as filed, provides the following explanation of the subject matter of claims 9 and 12 claims:

“... impurities such as organic matter and foreign matter are also contained, and these will become undissolved residue in water, and similarly cause the contamination of the plated film. Thus, these impurities must be reduced to 100 residues/L or less.”

Also, see page 9, lines 18-20, of the present application, as filed, which states with respect to Example 1 according to the present invention:

“When this high purity copper sulfate was redissolved and was filtered, there was no undissolved residue of 1 μ m or greater in water.”

Still further, see Table 1 on page 7 of the present application, as filed, which discloses that undissolved residue in water for the “raw material” and “Comparative Example 1” are 150

and 110 residue/L, respectively; whereas, there is “none” for Examples 1-3 according to the present invention.

Accordingly, claim 9 has been amended to require the copper sulfate to contain organic and foreign matter impurities at a sufficiently low level such that, when the copper sulfate is dissolved in water, undissolved residue of 1 μ m or greater exists in an amount of 100 residues/L or less. No new matter was added; for example, see the disclosures referenced above.

Applicants respectfully submit that this provides a further limitation relative to the base claim.

Claim 12 has been amended in a similar manner.

Accordingly, Applicants respectfully submit that claims 9 and 12, as amended, are in full compliance with 35 USC §112, second paragraph. Thus, Applicants respectfully request reconsideration and removal of the rejection.

II. Claim Rejections - 35 USC §103(a)

- A. *In the non-final Office Action dated November 12, 2008, claims 1, 9 and 11 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 5,240,497 issued to Shacham et al. in view of U.S. Patent No. 4,030,990 Piret et al.*

Shacham et al. discloses the use of 0.75 grams of CuSO₄·5H₂O (99.999%) in Example 1 (column 4, line 50) and 0.845 grams of CuSO₄·5H₂O (99.999%) in Example 3 (column 5, lines 45-46). Shacham et al. provides no disclosure, suggestion or teaching of how the copper sulfate was produced or what impurities it may contain. The recitation of “(99.999%)” is unexplained.

Accordingly, Applicants respectfully submit that Shacham et al. clearly fails to disclose, teach, or suggest the limitations of claim 1 of the present application requiring “contents of Ag impurities of less than 0.01wtppm, metalloid element impurities of As, Sb, and Bi of less than 0.1wtppm, respectively, radioactive elements of U and Th of less than 0.001wtppm, respectively,

and heavy metal elements of Fe, Cr, and Ni of less than 0.1wtppm, respectively” and the limitations of claim 9, as amended, requiring “organic and foreign matter impurities are contained at a level such that, when said copper sulfate is dissolved in water, undissolved residue of 1µm or greater exists in an amount of 100 residues/L or less.”

With respect to Ag contents, the present application, as filed, states that:

“Ag is very similar to Cu, and is an element that is difficult to remove. Further, since it does not have any adverse effects on the electrical conduction property, conventionally, this was never intentionally removed.”

With respect to organic matter and foreign matter impurities which become undissolved residue in water, the present application, as filed, states that “This was overlooked in the past.”

Accordingly, the Examiner’s rejection requires the teaching of the 5N purity copper sulfate of Sachem et al. to be modified according to the teachings of the Piret et al. patent in an attempt to overcome the above referenced deficiencies of the Sachem et al. disclosure.

Piret et al. teaches a copper recovery process in which a copper sulfate solution containing impurities is subjected to a two-step purification process. The first purification step includes adding Ca(OH)_2 and air to the solution to enable some amount of impurities to precipitate and be separated from the remaining solution. The second step includes adding a cupriferous reducing agent (Cu or Cu_2O) to precipitate impurities as copper (I) compounds and to separate these from the remaining solution by “fine filtration”.

In the Office Action, the Examiner readily acknowledges that Piret et al. fails to disclose “the ppm of impurities remaining” after the above referenced purification steps. Applicants respectfully submit that “the ppm of impurities remaining” provide important claim limitations that should not be simply ignored. This is because it is important to consider that the purification steps of Piret et al. are clearly different and inferior to those required by the present application

which specifically includes the combination of solvent extraction and active carbon treatment.

For example, as best stated in the present application, as filed, on page 6, lines 6-11:

“... active carbon treatment is performed to remove impurities such as organic matter and foreign matter as well as noble metals such as Ag. The removal of impurities such as organic matter and foreign matter and oil films, and the removal of noble metals such as Ag via carbon active treatment do not exist in conventional technology, and such removal technology is a new discovery and method provided by the present invention.”

It should also be noted that the claimed combination of solvent extraction with active carbon treatment to provide a means of manufacturing high purity copper sulfate at a low cost is also novel and non-obvious over the prior art of record. (See page 3, line 25, of the present application, as filed.)

In the Office Action, it is stated that claims 1, 9 and 11 are obvious over the cited references because “mere optimization of a known process does not involve an inventive step.” For the reasons already discussed above and for additional reasons discussed below, Applicants respectfully disagree that the subject matter of claims 1, 9 and 11 are directed to a “mere optimization”.

The copper recovery method of Piret et al. is a method of recrystallizing the copper sulfate solution and thereafter subjecting this to solid-liquid separation. One of ordinary skill in the art clearly will recognize the limitations of Piret et al. with respect to the removal performance of impurities contained in the copper sulfate. In addition, from the fact that the concentration of Ag, As and Sb is high as the cathode electrodeposits as described in Piret et al., it is evident that the refining efficiency of Piret et al. is significantly lower than that disclosed in the present application. Thus, Piret et al. could not simply be optimized to provide the purity level and ppm of impurities remaining as required by claims 1 and 9 of the present application.

Moreover, the present invention is characterized in combining a solvent extraction process and activated carbon treatment in addition to recrystallization and solid-liquid separation, and this enables the efficient removal of impurities at a very low cost. In contrast, Piret et al. merely discloses eliminating foreign matter by way of “fine filtration”. It would be clear to one of ordinary skill in the art that the removal performance of fine filtration disclosed by Piret et al. for eliminating foreign matter is considerably inferior in comparison to the process of the present invention in which foreign matter is absorbed with activated carbon treatment.

Accordingly, it would be clear to one of ordinary skill in the art that the method described in Piret et al. is unable to achieve the reduced levels of impurity content required by claims 1 and 9 of the present application. Thus, since it is impossible to achieve the low levels of impurity content specifically required by claims 1 and 9 of the present application based on the method disclosed by Piret et al., Applicants respectfully submit that it is an error to conclude that one of ordinary skill in the art could achieve the required contents based on Shacham et al. modified according to the Piret et al. process. The combination would likely lower the purity level of the copper sulfate disclosed by Shacham et al. and the ppm content of impurities remaining could not be reduced to that required by claims 1 and 9 of the present application. Thus, modifying Shacham et al. in view of Piret et al. would not “optimize” the copper sulfate of Shacham et al.; rather, it would deteriorate and reduce the purity of the copper sulfate.

For these reasons, Applicants respectfully submit that the rejection of claims 1, 9 and 11 based on Shacham et al. in view of Piret et al. should be removed. Claims 1, 9 and 11 are patentable and are not obviated by the cited combination. Further, one of ordinary skill in the art would avoid modifying the copper sulfate disclosed by Shacham et al. with the process disclosed by Piret et al. due to the fear of adding impurities to the copper sulfate of Shacham et al. which is

already at a 5N level. Applicants respectfully request reconsideration and removal of the rejection.

B. In the non-final Office Action dated November 12, 2008, claims 7, 10 and 12-14 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 4,908,242 issued to Hughes et al. in view of U.S. Patent No. 5,059,403 issued to Chen in further view U.S. Patent No. 5,240,497 issued to Shacham et al. and still in further view of U.S. Patent No. 4,030,990 Piret et al.

Hughes et al. disclose a method of depositing copper on a substrate by way of electroless deposition. It clearly fails to disclose a method of making high purity copper sulfate. Accordingly, it is clear that Hughes et al. fail to disclose the refining method of copper sulfate required by claim 7 of the present application which is characterized in dissolving copper sulfate, subjecting this to solvent extraction and performing activated carbon treatment thereto, and subsequently performing recrystallization. Further, Hughes et al. most certainly fails to disclose a refining method yielding an equal level of performance as that required by claim 7 of the present application.

In the Action, the Examiner states that it would be obvious to one of ordinary skill in the art at the time of the invention to purify the copper sulfate of Chen using the process disclosed by the Hughes et al. patent. However, as stated above, Hughes et al. discloses a method directed to depositing copper on a substrate by way of electroless deposition, not a method of making high purity copper sulfate. In addition, Hughes et al. clearly fail to disclose the refining method of copper sulfate required by claim 7 of the present application which is characterized in dissolving copper sulfate, subjecting this to solvent extraction and performing activated carbon treatment thereto, and subsequently performing recrystallization. Further, Hughes et al. most certainly fails

to disclose a refining method yielding an equal level of performance as that required by claim 7 of the present application.

The stated rejection also requires that Hughes and Chen be further modified and combined with the Shacham et al. and Piret et al. patents. As already discussed above in detail, Shacham et al. provide no details, explanation, disclosure, etc. concerning the copper sulfate used in Examples 1 and 3 of the Shacham et al. patent. Shacham et al. merely reference “(99.999%)” after the recitation of copper sulfate. No method steps for making copper sulfate is disclosed. One of ordinary skill in art is taught nothing with respect to a method of making a high purity copper sulfate by the Shacham et al. patent.

With respect to Piret et al., the copper recovery method of Piret et al. is a method of recrystallizing a copper sulfate solution and thereafter subjecting this to solid-liquid separation. One of ordinary skill in the art clearly recognizes the limitations of Piret et al. with respect to the removal performance of impurities contained in the copper sulfate. In addition, from the fact that the concentrations of Ag, As and Sb are high as the cathode electrodeposits as described in Piret et al., it is evident that the refining efficiency of Piret et al. is significantly lower than that disclosed in the present application. Thus, Piret et al. could not simply be optimized to provide the low impurity contents required by the present invention.

It is important to consider that the purification steps of the cited prior art are clearly different from those required by the present application which specifically includes the combination of solvent extraction and active carbon treatment. In addition, as best stated in the present application, as filed, on page 6, lines 6-11:

“... active carbon treatment is performed to remove impurities such as organic matter and foreign matter as well as noble metals such as Ag. The removal of impurities such as organic matter and foreign matter and oil films, and the removal of noble metals such as Ag via carbon active treatment do not exist in conventional technology, and such removal technology is a new discovery and method provided by the present invention.”

It should also be noted that the combination of solvent extraction with active carbon treatment to provide a means of manufacturing high purity copper sulfate at a low cost is also novel and unobvious. (See page 3, line 25, of the present application, as filed.)

Accordingly, Applicants respectfully submit that claims 7, 10 and 12-14 are patentable over the cited combination of references. The combination of method steps required by the claims of the present application is clearly not disclosed by the cited references, nor is a method that is capable of providing the high purity copper sulfate required by claim 7 provided by the cited references. For these reasons, Applicants respectfully request reconsideration and removal of the rejection of claims 7, 10 and 12-14.

Finally, new claims 15-21 are also directed to a method of making a high purity copper sulfate. No new matter was added. For example, see the present application, as filed, on: page 3, lines 21-25; page 6, line 4, to page 8, line 13; and page 9, lines 5-17. Applicants respectfully submit that these new method claims provide additional reasons for patentability over the prior art of record.

III. Conclusion

In view of the above amendments and remarks, Applicants respectfully submit that the claim rejections have been overcome and that the present application is in condition for allowance. Thus, a favorable action on the merits is therefore requested.

Please charge any deficiency or credit any overpayment for entering this Amendment to our deposit account no. 08-3040.

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